

THE MINERAL INDUSTRY OF NAMIBIA

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Namibia is located on the southwestern coast of Africa between South Africa and Angola. The 825,418-square-kilometer (km²) country had an estimated population of 1.95 million in 2003. Based on purchasing power parity estimates for 2003, the gross domestic product (GDP) was \$13.72 billion and the GDP per capita was about \$7,100.¹ The GDP growth rate in real terms was 3.3% for the year, and inflation dropped sharply from 12.8% in January to 2.1% in December 2003 as food shortages and price inflation were brought under control. The Namibian dollar, which is pegged to the South African Rand, appreciated by 19.8% in 2003 following a 22.8% appreciation during 2002. Similar to the minerals economy of South Africa, the exchange rate differential led to the reduction of local currency obtained from U.S. dollar-denominated mineral commodity export sales and had a negative impact on mining operations in Namibia. The mineral industry of Namibia, which employed more than 6,600 workers, provided about two-thirds of exports by value and 20% of the country's GDP. Diamond remained the most important sector of the mining industry, followed by uranium, for which Namibia ranked as the world's sixth leading producer. The contribution of zinc to the economy will increase significantly as the Skorpion zinc operation builds up to full operating capacity in 2006. Namibia was also the second leading producer of salt in Africa after Tunisia. Other important mineral products included copper, dimension stone (granite and marble), fluorite, gold, lead, and silver (Bank of Namibia, 2004§;² U.S. Central Intelligence Agency, 2004§). More than \$35 million was spent on exploration during 2003, with more than 80% of this amount devoted to offshore marine diamond exploration.

Government Policies and Legislation

The principle legislative documents that govern mineral and energy development in Namibia were available on the Ministry of Mines and Energy Web site at <http://www.mme.gov.na/mines/index.html>.

The basic mining law is the Minerals (Prospecting and Mining) Act No. 33 of 1992, which took effect on April 1, 1994. An accompanying Mining (Taxation) Act sets forth revised fiscal and royalty provisions for the industry, and section 138A of the Act outlines mine health and safety regulations. Amendments to the the Mining (Taxation) Act had been under consideration since 2000 and a draft revised Mining Act was expected to be presented to the Minister of Mines and Energy by March 2004. A new minerals policy designed to ensure the sustainable contribution of minerals to the socio-economic development of Namibia was approved in March 2003 and was available for reference at the Ministry of Mines and Energy's Web site (Minister of Mines and Energy, 2003§). The Diamond Act No. 13 of 1999 regulates and controls the holding, transport, and further processing of diamond through a system of licenses approved by the Diamond Commissioner. The Act also establishes a Diamond Board, a Diamond Board Fund, and a Diamond Evaluation Fund. Diamond exploration and mining licensing are administered separately by the Office of the Mining Commissioner. The Diamond Act requires diamond mining companies to pay an overall income tax of 55% of taxable income, plus a 10% royalty on the market value of diamond shipped and sold. The Income Tax Act provides that this 10% surcharge be credited against the income tax payable by diamond mining companies.

Petroleum exploration and development are regulated by the Petroleum (Taxation) Act No. 3 of 1991 and its regulations, which mandate an income tax and an additional profits tax (APT), and the Petroleum (Exploration and Production) Act No. 2 of 1991, which authorizes the Government to collect a 12.5% royalty on petroleum production. The Petroleum Laws Amendment Act 24 of 1998 amends the 1991 Petroleum (Exploration and Production) Act No. 2 and the 1991 Petroleum (Taxation) Act No. 3; the amendment, along with the Model Petroleum Agreement of September 1998, is designed to provide additional incentives to attract new foreign investment. The Petroleum Laws Amendment Act of 1998 introduced a number of new incentives, which include a reduction of royalties on the value of oil and gas production from 12.5% to 5%; a reduction of the petroleum income tax from 42% to 35%; allowance for an annual writeoff of all exploration and operating expenditures; and the introduction of an additional profits tax that will have a three-tiered rate system that will be triggered when licensees earn an after-tax real rate of return of 15%, 20%, and 25%, respectively. A draft Gas Act, which had been under consideration since 2000, was not acted upon during 2003.

The Foreign Investment Act of 1990 offers prospective investors a package of incentives, such as repatriation of profits, security of title and tenure, availability of foreign exchange, international arbitration, and fair compensation in case of expropriation.

The Ministry of Mines and Energy is responsible for making and enforcing policies related to minerals and energy. Within the Ministry and attached to the Permanent Secretary are the Diamond Board, the Mining Advisory Board, and the National Energy Council, all of which have Government and private-sector representation. The National Petroleum Corp. of Namibia (NAMCOR) and the Namibia national electric utility NamPower also are part of the ministry. The five main directorates in the ministry are Administration and Finance, Diamond Affairs, Energy, Geological Survey, and Mining. The three main functions of the Mining Directorate are to evaluate and control mineral license applications; ensure adequate safety standards in mining operations; and collect, analyze, and disseminate production statistics. An Ancillary Rights Commission within the Ministry handles dispute arbitration.

¹Where necessary, values have been converted from Namibian dollars (N\$) to U.S. dollars (US\$) at the rate of N\$7.4968=US\$1.00 for 2003 and N\$10.468=US\$1.00 for 2002.

²References that include a section mark (§) are found in the Internet References Cited section.

The Namibia Ministry of Trade and Industry (2003b§) actively promoted foreign investment to develop the mining sector. Various projects listed on its Web site included development of several new copper mines for Ongopolo; a semiprecious gemstone cutting and polishing plant; an agate, amethyst, and quartz property in the Brukaros Mountains; expansion of the Cape Cross salt operation to 500,000 metric tons per year (t/yr) from 50,000 t/yr; a copper-silver tailings retreatment project at Klein Aub; assistance to Savannah Marble CC to develop marble quarries at Karibib; a project to reactivate the Usakos Wollastonite Mine; and a project to recover germanium from Tsumeb smelter slags.

Environmental Issues

As one of the major sectors of the economy, the mining industry played an active role in funding conservation awareness and environmental education programs. Some of Namibia's mines were located in or close to one of the world's oldest deserts, the Namib, which is host to a number of extremely rare species of plant and animal life. Because this unique habitat is one of Namibia's most valuable tourist assets, the ecosystem continued to be closely monitored by the local and international scientific and conservation communities. The competition for limited water resources between human and industrial uses remained an ongoing environmental concern for the country.

In addition to the desert, Namibia possesses several wetland areas of international repute, particularly the Etosha Salt Pan, the Kavango/Caprivi region, the Walvis Bay lagoon, and Sandwich Harbor, as well as the mouths of the Orange and Kunene Rivers. The fragile nature of these desert and wetland ecosystems had to be taken into account during the consideration of any infrastructure projects, such as railroads or pipelines, between Walvis Bay and northeastern Namibia and Botswana. Comprehensive studies were undertaken to assess the effects of marine mining operations on these areas and, in particular, the effect of changes in tidal patterns caused by the disposal of fine sediments during offshore mining. In addition, work was being carried out to assess the extent of interaction between marine mining activities and the local fishing (mainly lobster) and mariculture (oyster and mussel production) industries to provide information that could be used to help these industries develop and coexist with minimal adverse effects upon each other.

Production and Trade

During 2003, mineral production results were mixed, as copper, diamond, fluorspar, gold, and uranium experienced a from 2% to 13% decline in output. The 10% drop in domestic blister copper production was compensated for by increased import of copper concentrates from the Dikulushi Mine in Congo (Kinshasa) for toll smelting. Uranium continued to be affected by weak international demand. The liquidation in November 2002 of the assets of Namibian Minerals Corp. (Namco), which was a United Kingdom-based firm that had been listed on the Namibian and Toronto stock exchanges, led to a 5% drop in the national production of diamond. Lead, silver, and zinc production increased significantly as the Rosh Pinah Mine increased its concentrate output by more than 40% and the startup Skorpion Project began ramping up its production of refined zinc. The 51% increase in silver contained in base-metal concentrates between 2002 and 2003 may be attributed, in part, to the unusually high silver content of the imported Dikulushi copper-silver concentrates.

According to the Bank of Namibia (2004§), the merchandise trade deficit increased to \$466 million in 2003 from \$173 million in 2002. Total merchandise exports in 2003 were valued at \$1,260.6 million, of which diamond accounted for \$515.5 million (41%); other mineral commodities, chiefly uranium, for \$184.2 million (15%); and manufactured products, for \$356.4 million (compared with \$163 million in 2002). The increased value of manufactured product exports, which included processed copper and zinc, was owing to the new Skorpion zinc development. The decline in diamond export revenues to 41% of total export revenues compared with 50% in 2002 was attributable, in part, to the bankruptcy and liquidation of the Namibian Diamond Corp. Total merchandise imports were valued at \$1,367.7 million in 2003, of which fuel and energy products accounted for less than 10%. The United States, along with the five member countries of the South African Customs Union (SACU)—Botswana, Lesotho, Namibia, South Africa, and Swaziland—began negotiating a Free Trade Agreement (FTA) in June 2003. A SACU-U.S. FTA, along with the existing U.S. African Growth and Opportunity Act, could shift the relationship of the two blocs from aid dependency to one based on mutual trade. SACU was also negotiating similar trade agreements with El Mercado Común del Sur (Mercosur), which was the Latin American trade bloc comprised of Argentina, Brazil, Paraguay and Uruguay, and the European Free Trade Association, which included Iceland, Liechtenstein, Norway, and Switzerland.

Commodity Review

Metals

Copper.—Ongopolo Mining and Processing Limited, which was a partnership between managers of the former Tsumeb Copper Limited (TCL) and the National Union of Namibian Workers (NUMW), continued to operate of the Tsumeb copper smelter and the Khusib Springs, Kombat, and Otjihase copper-lead-silver mines during 2003. According to the Chamber of Mines of Namibia (2004), production of blister copper at the Tsumeb smelter declined by about 2% to 26,036 metric tons (t) from 26,703 t in 2002; nearly 40% of blister copper production came from imported toll concentrates from Congo (Kinshasa), South Africa, Zambia, and Zimbabwe. Blister copper production in 2003 also yielded 18.14 t of silver and 127 kilograms (kg) of gold. The company completed the upgrade

of the Tsumeb concentrator and planned to refurbish the copper smelter and reestablish the lead treatment and refining plant at Tsumeb. At Ongopolo's mine operations during 2003, the Kombat Mine experienced a 30% drop in the gross weight of copper concentrates to 16,701 t; the Otjihase Mine produced 35,500 t of copper concentrates and 31,786 t of pyrite concentrates. A small open pit mine that was started up in 2003 at Otjihase will supplement underground production. The new Tsumeb West Mine came into production in 2003 to replace the Khusib Springs Mine; 12,657 t of copper concentrates was produced. In other development projects, the company completed 60% of shaft development at the Asis Far West exploration shaft, which was expected to be operational by yearend 2004. The first phase of mining and metallurgical testing was completed at the Tschudi Mine, and feasibility studies would continue through 2004. An estimated \$30 million would be needed to develop the Tschudi Mine (Chamber of Mines of Namibia, 2004).

The joint venture between Ongopolo and ZincOx Resources Plc of the United Kingdom was expected to complete its feasibility study by yearend 2004. The study would evaluate the potential for extracting germanium from the old Tsumeb slag dumps using the existing Ausmelt furnace at Tsumeb to reduce the slag to a zinc-rich oxide dust.

Lead and Zinc.—Skorpion Zinc (Pty.) Ltd., which was owned 100% by Anglo American plc, continued to develop the \$454-million Skorpion zinc mine and refinery project, which was located approximately 85 kilometers (km) northeast of Oranjemund and 25 km north of Rosh Pinah. First metal was produced at the site in May 2003. Mechanical and equipment problems delayed the full rampup of production by at least three months to March 2004. When completed, Skorpion will be the largest zinc solvent-extraction operation in the world, and will produce 150,000 t/yr of special high-grade zinc during a mine life of at least 15 years. Anglo American reported Skorpion mineral reserves at yearend 2003 to be 11.2 million metric tons (Mt) of proven reserves at a grade of 11.4% zinc and 9.5 Mt of probable reserves at a grade of 9.69% zinc (Anglo American plc, 2004§, p. 96).

Rosh Pinah Zinc Corporation (Pty.) Ltd., which was owned by Kumba Resources of South Africa, operated the Rosh Pinah underground zinc mine. During 2003, Rosh Pinah increased production of zinc concentrates by 39% to 107,920 t that contained 58,352 t of zinc, 2,147 t of lead, and 8.12 t of silver; and production of lead concentrates by 30% to 31,453 t that contained 16,635 t of lead, 2,148 t of zinc, and 18.84 t of silver. The higher production rates were attributable to the mining of higher-grade ores and production debottlenecking. An accelerated mine exploration and development program was started to keep up with the higher ore-production rates. Concentrates were sent through Walvis Bay to Kumba's Zincor refinery in South Africa for treatment and accounted for nearly 40% of Zincor's feedstock. Kumba also began a 2-year program to upgrade the surface of the main ore transport road from Rosh Pinah to Aus from gravel to tar (asphalt) (Chamber of Mines of Namibia, 2004).

Gold.—AngloGold (Namibia) Pty. Ltd. held a 100% interest in the Navachab gold mine near Karibib. The Navachab Mine accounted for nearly 95% of national gold output, and the remainder came as a byproduct of copper mining. Navachab had the capacity to treat 1.32 million metric tons per year (Mt/yr) of ore. Production in 2003 was 2,298 kg compared with 2,650 kg in 2002. The decrease was attributable to lower ore throughput and lower recovery grades. After 14 years of using a contract miner, AngloGold began to do its own mining at Navachab during 2003. Lower production was expected during 2004 as the company focused on overburden-stripping of its Eastern Pushback project. The pushback was intended to extend the pit 80 to 90 meters (m) to the east and increase the depth from 190 m to 230 m. The project was expected to extend the life of the mine from 2005 to at least 2013, with a possible further extension to 2020, and to increase planned production from 6,345 kg of gold during years 2003-05 to 20,500 kg/yr of gold during years 2005-13. The capital cost of new mining equipment and the expansion project was estimated to be \$100 million by the Chamber of Mines of Namibia (2004). As of yearend 2003, mineral reserves were reported to be 1.3 Mt of proven reserves at a grade of 1.38 grams per metric ton (g/t) gold and 10.1 Mt of probable reserves at a grade of 1.81 g/t gold. Mineral resources, which included reserves, were reported to be 8.7 Mt of measured resources at a grade of 0.79 g/t gold, 56.9 Mt of indicated resources at a grade of 1.31 g/t gold, and 60.8 Mt of inferred resources at a grade of 1.04 g/t gold. Resource estimates were based on a \$350 per ounce gold price and a 0.8 to 0.9 g/t gold cutoff grade (Tassel, 2003a; AngloGold Limited, 2004§).

The Canadian company Boulder Mining Corp. explored for iron oxide-copper-gold deposits at its Teverede Project in northwestern Namibia. Drilling of geochemical and gravity anomalies began in September 2003 (Boulder Mining Corp., 2004§).

Silicon.—Namibia Metals (Pty) Ltd. had proposed building a \$50-million silicon-metals plant at Omaruru in 2000 but faced problems arranging financing. As a result, in 2001, the Ministry of Mines and Energy withdrew Namibia Metals' mineral rights to the quartz deposit at Omaruru and transferred them to a new company, Ozondje Mining. In February 2004, following a failed 10-year effort to develop the project and an acrimonious legal battle in 2002-03, the Namibian High Court ruled in favor of the Ministry of Mines and Energy's action (Dentlinger, 2004§).

Tin and Tantalum.—During 2002, a small tantalite mine was opened by the Albaca Mining Company, which was a subsidiary of Central African Mining and Exploration Co. PLC (CAMEC) of London. The Three Aloes Mine, which was located 10 km south of Uis, produced 1.5 metric tons per month (t/mo) of tantalite concentrate and was capable of increasing production to 3 t/mo of tantalite concentrate. CAMEC also bought concentrates from local artisanal miners, who produced about 400 kg per month of salable concentrate. CAMEC also held interests in the Falcon, Goantagab, and Strathmore tin-tantalite prospects. CAMEC had outlined 1.5 Mt of pegmatitic material at Falcon and planned to commence mining there in 2003 at a rate of 40 metric tons per hour to yield 7 t/mo of tantalite concentrates at 36% Ta₂O₅ and 6 t/mo of tin concentrates at 60% SnO₂. After a brief but nearly six-fold run-up in tantalum prices to more than \$200 per pound during 2000, several companies, which included IMG Tantalum and AFB Exploration (Pty) Ltd. of Germany, looked to reopen old tantalum pegmatite areas in the Tantalite Valley in the Karas region, which were located just north of the Orange River. The return of market prices to normal levels during 2001-03, however, removed the incentive for new tantalum exploration and development (Tassel, 2003d).

Uranium.—Rössing Uranium Ltd., which was owned by Rio Tinto plc of the United Kingdom (68.6%), was the sixth leading producing uranium mine in the world and the second in Africa after Niger. It produced 2,401 t of uranium oxide from 19 Mt of rock in 2003, which was a 12% decline from that of 2002 (Uranium Information Center, 2004§). The uranium oxide was exported to central Europe, North America, and Southeast Asia for use in generating electricity in nuclear powerplants. The company operated at a loss in 2003, but as the uranium market improved, Rössing expected to produce about 3,050 t of uranium oxide in 2004, which was still only about 67% of its capacity. During 2003, the company replaced its tailings pumping system with an overland belt conveyor at one of the world's largest open pit mines and moved more than 25 Mt/yr of ore and waste material. The high cost of imported sulfuric acid could lead Rössing to restart its acid plant, which would use feed from Ongopolo's pyrite production. The mine consumed about 180,000 t/yr of sulfuric acid for use in leaching the ore. A feasibility study on expanding the open pit 300 m to the south, expanding the crushing plant and the mining fleet, and updating the process technology aimed at extending the mine life until at least 2020 was completed in 2003. The plan anticipated a return to full production and would double tonnage mined to 55 Mt/yr. A go-ahead decision was subject to the right economic conditions being in place (Tassel, 2003c; Chamber of Mines of Namibia, 2004; Rössing Uranium Ltd., 2004§).

Paladin Resources Ltd. of Australia was scheduled to begin a feasibility study in April 2004 on developing the Langer Heinrich open pit uranium mine. The yearlong study would be based on a production rate of 1000 t/yr of uranium oxide at an average sales price of \$20 per pound during a mine life of 10 years. If approved, the mine could be in production by 2006. The Langer Heinrich deposit was located about 80 km northeast of Walvis Bay. It was described as a surficial uranium deposit with carnotite mineralization associated with calcite and dolomite in a paleo-river channel that was 15-km long and up to 45-m deep (Paladin Resources Ltd., 2004; Markwell, 2004§).

Industrial Minerals

Cement.—The Namibia Ministry of Trade and Industry sought investment partners for Omega Cement Co. (Pty.) Ltd. to build a 200,000 t/yr cement plant in Namibia, which would help save the country approximately \$13 million per year in cement imports (Namibia Ministry of Trade and Industry, 2003a§).

Diamond.—Diamond accounted for about 41% of total exports by value in 2003, while production of diamond decreased by more than 4% to 1,481,489 carats, of which 46% came from marine sources. Namdeb Diamond Corp. (Pty.) Ltd. (Namdeb), which was established in 1994 as a 50-50 joint venture between De Beers Centenary AG and the Namibian Government, was the leading diamond producer. During 2003, Namdeb produced 1,454,756 carats, of which 807,139 carats was from onshore marine mining, 602,037 carats was from De Beers Marine Namibia (formerly Debmarine) deepwater mining, and 45,450 carats was from beach and shallow water mining. During 2003, Namdeb began a \$50-million expansion of its Elizabeth Bay operations and acquired two offshore mining vessels, the *MV Ya Toiva*, which was one of the liquidated Namco assets, and the *MV Gariep*, which had been converted to a drilling ship. The addition of these two vessels was expected to expand marine mining production by 160,000 carats during 2004. The Elizabeth Bay project will involve conversion to a wet-processing system to permit recovery of diamond from cemented and clay-based materials, which could extend the life of the mine by an additional 10 years. A second, \$11-million Pocket Beaches Project was expected to begin mining a number of small bay deposits that were located between prominent headlands. The Pocket Beach mining was scheduled to begin in 2004, and the ore would be processed in mobile units onsite. De Beers Marine Namibia, whose 2003 production was up 17% from 513,053 carats in 2002, spent more than \$13 million to delineate future mining areas. De Beers Marine also acquired the seabed-crawler *NamSSol II* (*Nam 2*) from Namco liquidators for US\$20 million (Chamber of Mines of Namibia, 2004; De Beers Consolidated Mines Ltd., 2004§).

Faced with increasing financial problems, which included \$50 million of debt, Namco ceased operations at the end of November 2002, and the company's debtors liquidated Namco assets in 2003. Namco had produced 235,616 carats of diamond from its offshore marine operations in 2002. As part of the liquidation, the Leviev Group of Israel, through LL Mining, established a new company, Sakawe Mining Corp. (Samicor). In July 2003, the Leviev Group purchased Namco and Island Diamonds and thereby acquired 13 mining licenses and 23 exploration licenses. Samicor planned a 30-month exploration program to identify reserves of 1.2 million carats of marine diamond, which would be sufficient to produce at a rate of 150,000 carats per year. In July, Samicor purchased the *MV Namibian Gem*, renaming it the *MV Sakawe Miner*, and chartered the *MV Kovambo*. In November 2003, the company purchased a second vessel, the *MV Sakawe Explorer*. After it outfitted the vessels, Samicor expected to start exploration and mining operations in the second quarter of 2004 (Chamber of Mines of Namibia, 2004).

Diamond Fields (Namibia) (Pty) Ltd., which was owned by Diamond Fields International Ltd. (DFI) of Canada, recovered 16,762 carats of diamond in 2003 compared with 25,401 carats in 2002 at its Marshall Fork and Diaz 12 marine deposits. The reduced recovery resulted from a 6-month midyear hiatus in mining that took place while the marine mining subcontractor was changed to a new South African empowerment company, Lazig Marine (Pty) Ltd., and the mining vessel *MV Anya* was refurbished. In January 2004, DFI suspended mining operations owing to high operating costs that resulted from the unfavorable Rand/dollar exchange rate. In January 2004, DFI entered a joint-venture agreement with Samicor to carry out diamond mining operations on a 50-50 basis on DFI's marine license ML111 near Luderitz, using the charter vessel *MV Kovambo* and a third generation seabed crawler. Following refurbishment of the *MV Kovambo* in South Africa, mining was expected to begin by June 2004. DFI's share of mining costs would be capped at \$400,000 per month. The agreement was for 6 months, and DFI would have sole option to renew for an additional 6 months (Chamber of Mines of Namibia, 2004; Diamond Fields International Ltd., 2004§).

Diaz Exploration (Pty.) Ltd. reported production of 9,971 carats from offshore operations during 2003 compared with 12,683 carats during 2002. Afri-Can Marine Minerals Corporation of Canada held options and joint-venture agreements with several Namibian empowerment groups that controlled 28 marine concessions and covered 26,500 km². During 2003, Afri-Can focused its exploration efforts on the offshore block J (Woduna concession) north of Hottentot Bay, where 84 gem-quality diamonds that weighed 11.2 carats were collected during Phase 2 sampling. In January 2004, Afri-Can also agreed to acquire a 75% interest in the Gibeon kimberlite field in southcentral Namibia (Afri-Can Marine Minerals Corporation, 2004\$).

Reefton Mining NL of Australia through its Namibian subsidiary Storm Diamond Mining (Pty.) Ltd. held three exploration licenses for diamond that covered 200 km of coastline beaches along the Skeleton Coast. During 2003, Storm continued to sample and trench the beach terraces with its own screening and portable 10-metric-ton-per-hour gravel-washing dense-media separation plant. By yearend, the company had recovered 590 high-quality diamonds that weighed 141.75 carats. Also, at yearend, Storm considered initiating a feasibility study to assess the capital and operating costs to install a 1 Mt/yr operation to process diamondiferous beach sands and gravels. Reefton also held several gold, rare-earth, and tantalite exploration licenses in Namibia (Reefton Mining NL, 2004\$).

On the value-added side, NamGem Diamond Manufacturing Co. exported 30,000 polished stones during 2003. Namgem also signed a 2-year agreement with Lazare Kaplan International to assist with a premium marketing program and with upgrading skill levels at the cutting and polishing factory beginning in January 2004 (Chamber of Mines of Namibia, 2004). The Leviev Group also planned to open a new \$6.5-million diamond cutting and polishing plant in Windhoek by June 2004 to process diamond recovered by its mining subsidiary, Samicor. The plant will be capable of processing 300,000 to 360,000 carats of diamond per year (IDEX Online News Room, 2004\$).

Fluorspar.—Okorusu Fluorspar (Pty.) Ltd. was operated as a captive mine to supply fluorspar to its parent company Solvay AG of Germany. Okorusu is located about 60 km north of Otjiwaraongo. The processing flow sheet was custom-designed to handle the complex mineralogy of the carbonatite-hosted fluorite deposits at Okorusu. During 2003, however, Okorusu encountered a zone of high iron content in its ore that required an adjustment to its flotation plant flow sheet. As a result, production of acid-grade fluorspar reached only 79,349 t, which was short of its expansion goal. An upgraded mining-truck fleet and new milling and flotation facilities were designed to bring production levels to 95,000 t/yr of acid-grade fluorspar in 2003 and 100,000 t/yr in 2004. Reserves were sufficient to maintain production at 100,000 t/yr of concentrate for 15 years. Ore was trucked 20 km from the mine to a rail siding and then railed to Walvis Bay for export. The company ended exploration of the Omburu fluorspar prospect, which was located 30 km east of Omaruru in the Erongo region, because indicated ore reserves were too small to support development (Tassel, 2003b; M. Dawes, Okorusu Fluorspar (Pty.) Ltd., written commun., February 5, 2004).

Mineral Fuels

Namibia, which had no domestic production of coal, gas, or oil, was import-dependent for most of its energy needs. The hydroelectric dam at Ruacana provided 249 megawatts (MW) of power, and an additional 600 MW was imported from South Africa under arrangements with Eskom Ltd. and the South African Power Pool. The country's hopes for meeting future energy requirements rested on development of its hydroelectric potential and extensive offshore gas reserves. Shell Exploration and Production Namibia B.V. (75%), ChevronTexaco (12.5%), and Energy Africa Ltd. (12.5%) held the rights to the offshore Kudu gasfield. The Government and Shell examined the potential for developing this resource for more than 8 years, but were unable to work out the right combination of financing and supporting projects to justify the multi-billion dollar investment required for its development. The project experienced a setback in September 2002 when Shell withdrew and again in December 2003 when ChevronTexaco relinquished its interests. According to the U.S. Energy Information Administration (2004\$), proven reserves at Kudu were estimated to be 36.8 billion cubic meters, which was well short of the 142 billion cubic meters needed for the proposed \$2.5-billion floating liquefied natural gas (LNG) facility. The cost of the first phase of Kudu's development, which involved piping gas ashore to an 800-MW power station at Oranjemund, was estimated to be \$400 million. In January 2004, Namcor acquired a 10% interest in the offshore Kudu gasfield license; the remaining 90% interest was held by the South Africa-based (but Malaysian-owned) Energy Africa Ltd.. Two groups were active in petroleum exploration: Vanco Energy of the United States, which drilled in block 1711 (Kunene Prospect) in the northernmost Namibian area where reserves were estimated to be 700 million barrels of oil and 170 billion cubic meters of gas; and a joint venture between the First African Oil Corporation and Namcor that held the license on eight blocks in the Namibe Basin, which straddles the maritime border between Angola and Namibia. The Namibe Basin license area was jointly administered by the two countries (U.S. Energy Information Administration, 2004\$).

Outlook

The long tradition of mining in Namibia is being given a substantial renewal since the reopening of the Tsumeb mines and smelter in 2000, the opening of the new Skorpion zinc project in 2003, the expansion of fluorspar and gold mines, and the continued success of offshore diamond exploration and development. These successes and higher world commodity prices are encouraging further exploration for base metals, diamond, and gold. Although offshore diamond production experienced some setbacks in recent years owing to technical or business reasons, the potential for development of diamond resources remains strong and production is expected to start increasing in 2004 and 2005 as new players enter the sector. Such new mine developments, along with the potential for new value-added manufacturing, metal-processing, and gemstone cutting and polishing industries, should keep the minerals sector a central

part of the economy of Namibia for the foreseeable future. The Government's ability to attract new investment to harness the natural gas and hydroelectric power potential of the Kunene River will strongly influence future economic growth. A restructuring of the Kudu gas project ownership during 2004 may encourage a new investment approach to its development. In the longer run, greater development of the regional transportation infrastructure in northern Namibia, stimulated by the completion of the Trans Kalahari and Trans Caprivi highways, could see Walvis Bay become a significant export route for new mineral developments in Angola and in the landlocked countries of Botswana and Zambia. With a climate that is among the driest in the world, Namibia will continue to deal with the lack of water resources as a constraint on development.

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Major Sources of Information

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Chamber of Mines of Namibia, Annual Report.

Geological Survey of Namibia, 1992. The Mineral Resources of Namibia, 598 p.

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TABLE 1
NAMIBIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003
METALS					
Arsenic, white, 99% arsenic trioxide	--	--	914	880	389
Copper:					
Mine output, concentrate (26% - 30% Cu):					
Gross weight	--	19,099	53,790	63,997	64,869
Cu content	--	5,620	12,393	18,012	19,500 ^e
Metal, blister: ²					
From domestic concentrates	--	5,082	18,386	17,850	16,106
From imported toll concentrates	--	--	8,629	8,853	9,930
Total	--	5,082	27,015	26,703	26,036
Gold kilograms	2,005	2,417	2,706	2,644	2,425
Lead, mine output, concentrate:					
Gross weight	18,653	20,665	25,565	24,140	31,453
Pb content of Pb and Zn concentrates	9,885	11,114	12,088	13,809	18,782
Silver:					
Mine output, Ag content of concentrate kilograms	9,670	9,287	20,396	43,632	45,100
Metal, refined, primary ² do.	--	8,790	18,150	12,020	18,140
Tantalite:					
Gross weight, concentrates	--	--	--	23 ^e	100 ^e
Ta content (36%)	--	--	--	8	36
Tin:					
Gross weight, concentrates	--	--	--	--	72
Sn content (60%)	--	--	--	--	43
Uranium, U ₃ O ₈	3,171	3,201	2,640	2,751	2,401
Zinc, mine output, concentrate (49% - 54% Zn):					
Gross weight	70,620	73,535	70,923	77,587	107,920
Zn content of Zn and Pb concentrates	35,140	39,126	37,622	42,685	60,500
Metal, refined, primary ²	--	--	--	35	47,436
INDUSTRIAL MINERALS					
Cement ^e	150,000	--	--	--	--
Diamond, gem thousand carats	1,633	1,552	1,487	1,562	1,481
Fluorspar, acid grade (97% CaF ₂) ³	71,011	66,128	81,551	81,084	79,349
Gypsum	1,250	588	--	--	--
Salt	502,770	523,009	543,218	630,159 ^r	697,914
Semiprecious stones:					
Agate	95	96	138	190	150 ^e
Amethyst kilograms	--	4,850	4,500 ^e	4,500 ^e	1,000 ^e
Chrysocolla do.	--	--	2,685	13	-- ^e
Garnet do.	--	134	150 ^e	150 ^e	100 ^e
Pietersite	--	20	5,370	--	-- ^e
Rose quartz	--	74	30	--	-- ^e
Sodalite	429	457	46	1,691	500 ^e
Tourmaline kilograms	--	390	--	--	-- ^e
Stone:					
Dolomite	8,000 ^e	--	19,593	--	10,000 ^e
Granite	5,866	7,222	5,723	24,754	20,000 ^e
Marble	11,221	24,426	18,337	3,182	5,000 ^e
Sulfur, pyrite concentrate:					
Gross weight (49% - 51% S)	--	11,967	68,674	3,633	31,786
S content	--	5,704	34,491	1,874	16,390
Wollastonite	347	441	284	742	700 ^e

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to total shown. ^rRevised. --Zero.

¹Table includes data available through May 15, 2004.

²Includes products of imported concentrate.

³Fluorspar production shown in wet metric tons; approximately 9% moisture.

Sources: The Chamber of Mines of Namibia Annual Reports, 1999-2003, and Namibia Ministry of Mines and Energy response to U.S. Geological Survey Minerals Questionnaire, 2001-2002.

TABLE 2
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Arsenic		Ongopolo Mining & Processing Ltd.	Plant at Tsumeb smelter	1,000 refined arsenic trioxide.
Copper		do.	Copper smelter at Tsumeb	58,000 blister copper; 20 silver; 200 kg gold.
Do.		do.	Ojithase copper mine, near Tsumeb	12,000 copper in concentrates; 32,000 pyrite concentrates.
Do.		do.	Komabat copper mine, 50 kilometers south of Tsumeb	8,000 copper in concentrates.
Do.		do.	Tsumeb West Mine (opened 2003, replaces Khsuib Springs Mine)	4,000 copper in concentrates.
Do.		do.	Asis Far West shaft (opens end of 2004)	NA.
Do.		do.	Tschudi Mine (under feasibility study 2004)	6,000.
Do.		do.	Tsumeb tailings retreatment (2005?)	NA.
Do.		do.	Aussmelt zinc smelter	NA.
Diamond	carats	Namdeb Diamond Corp. (Pty.) Ltd. (Government, 50%, and De Beers Centenary AG, 50%)	Mining Area 1, from Orange River to 145 kilometers north of Oranjemund	450,000.
Do.	do.	do.	Orange River Mines, from mouth of Orange River east to Sendelingsdrif, Daberas Mine and plant opened 2002	280,000.
Do.	do.	do.	Northern Areas and Elizabeth Bay Mines, 24 kilometers south of Luderitz	150,000.
Do.	do.	do.	Beach and Marine contractors	100,000.
Do.	do.	De Beers Marine Namibia (Namdeb, 30%, and De Beers Centenary AG, 70%)	Several mining vessels offshore of Sperrgebiet in Atlanta 1 license area	700,000.
Do.	do.	NamGem Diamond Manufacturing Co. (Pty.) Ltd., (Namdeb, 100%)	Diamond cutting and polishing plant at Okahandja, 70 kilometers north of Windhoek	30,000.
Do.	do.	Leviev Group of Israel	Diamond cutting and polishing plant at Windhoek (opens June 2004)	300,000 to 360,000.
Do.	do.	Sakawe Mining Corp. (successor company to Namibian Minerals Corp., which was liquidated in 2003; owned by LL Mining of Israel)	3 mining vessels offshore near Luderitz Bay	150,000 carats by 2006.
Do.	do.	Diamond Fields International Ltd. of Canada, 50%, and Sakawe Mining Corp. to handle contract mining, 50%	Marshall Fork and Diaz 12 marine deposits	35,000.
Do.	do.	Storm Diamond Mining (Pty.) Ltd., (Reefion Mining NL of Australia, 100%)	Beach terrace deposits, Skeleton Coast (exploration ongoing in 2004)	NA.
Do.	do.	Afri-Can Marine Minerals Corporation (Canada)	Block J, north of Hottentot Bay (exploration ongoing in 2004)	NA.
Do.	do.	Diaz Exploration (Pty) Ltd.	Marine mining	10,000 to 15,000 carats.
Fluorspar	do.	Okorusu Fluorspar (Pty.) Ltd.	Mine and plant at Okorusu	100,000 acid-grade fluorite.
Germanium		Ongopolo Mining & Processing Ltd. 50%, and ZincOx Resources plc (United Kingdom), 50%	Ausmelt zinc smelter at Tsumeb (zinc slag reprocessing; 2003 feasibility study)	NA.
Gold	kilograms	Anglogold Namibia (Pty.) Ltd.	Navachab Gold Mine	2,500; 8,300 by 2005.
Salt		Salt Company (Pty.) Ltd.	Swakopmund	150,000.
Do.		Walvis Bay Salt Refiners (Pty.) Ltd.	Walvis Bay	600,000.
Do.		Cape Cross Salt (Pty.) Ltd.	NA.	15,000.

See footnotes at end of the table.

TABLE 2--Continued
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Tantalite	Albaca Mining Co. [Central African Mining & Exploration Co. (United Kingdom), 100%]	Three Aloes Mine, 10 kilometers south of Uis	36 tantalite concentrates.
Do.	do.	Falcon Mine (2004 startup?); concentrates are 36% tantalite and 60% cassiterite	84 tantalite concentrates; 72 tin concentrates.
Do.	IMG Tantalum [AFB Exploration (Pty.) Ltd. (Germany)] (Opened 2001, closed early 2002)	Mine in Tantalite Valley in Karas region, north of Orange River	20 tantalite concentrates; 1 niobium in concentrates.
Uranium	Rossing Uranium Ltd. (Rio Tinto Group, 68.6%, and Government, 3.5%)	Rossing Mine, 65 kilometers northeast of Swakopmund	4,800 uranium oxide.
Do.	Paladin Resources Ltd. (Australia)	Langer Heinrich deposit, 80 kilometers northeast of Walvis Bay (2004 feasibility study)	1,000 uranium oxide. ^c
Wollastonite	Namibia Mineral Development Co. (Pty.) Ltd.	Uskos Mine	800 wollastonite; 20,000 dolomite. ^c
Zinc	Rosh Pinah Zinc Corp. (Pty.) Ltd. (Kumba Resources Ltd., 100%)	Rosh Pinah Mine, near Rosh Pinah (produce a zinc and a lead concentrate)	110,000 zinc in concentrates; 20,000 lead in concentrates; 25 silver in concentrates.
Do.	Skorpion Zinc (Pty.) Ltd. (Anglo American plc, 100%)	Skorpion Mine, solvent extraction, and electrowinning refinery, 25 kilometers north of Rosh Pinah (Full capacity by 2004)	150,000 refined zinc.

^cEstimated. NA Not available.